

WIRELESS LOCAL AREA NETWORK INTERNET ACCESS SYSTEM

BACKGROUND OF THE PRESENT INVENTION

Generally, the present invention relates to a wireless local area network Internet access system providing travelers with ad hoc Internet access.

5 More specifically, the present invention relates to a system and method for travelers conveniently accessing the Internet through a wireless local area network. The wireless local area network includes a rental station having a network access script generator for generating a network
10 access script, a network access database, and a data input unit. The network access script is used to automatically install a wireless station adapter in a communication device, to synchronize the wireless station adapter to an access point of wireless local area network and to provide
15 Internet access including bandwidth assignment.

DESCRIPTION OF THE RELATED ART

As the Internet has grown in popularity, both business and non-business users have come to desire, and indeed required, convenient and high-speed Internet access.

20 Non-business users, e.g., home users, typically connect to the Internet through dial-up modem connections, digital subscriber line ("DSL") connections, or cable-modem connections. A high skill level is required for successfully installing and configuring equipment necessary to make DSL
25 connections and cable-modem connections. A lower level of skill is required for dial-up modem connections; however, the process none-the-less challenges most users as device drivers, system software, and Internet service provider ("ISP") protocols must be coordinated.

30 Businesses face similar problems, but rely on computer technician support for system installation and maintenance. In addition to the above-mentioned means for connecting to the Internet, businesses may provide multiple users with Internet access via a network. OBENHUBER et al.

6,144,638 discloses one such system. Such systems require computer technician support for adding users to the network. Further, such systems have issues concerning access speed, as well as security issues concerning monitoring and controlling individual users.

When persons travel, they continue to have a need to access the Internet and typically travel with a notebook computer. Public access terminals have been proposed as a means for allowing individual users access to the Internet.

10 SOKAL et al. 5,953,504 discloses one such system.

Such systems, however, do not meet all of the traveler's needs. For example, when using a public access terminal, the traveler does not have access to her own notebook's files and programs. Transferring files to a computer-readable medium, e.g., a diskette, is not convenient and may raise issues of file compatibility with the public access terminal programs. Further, working at a fixed-location public terminal may not let the traveler work with a high-speed connection, conveniently and may not offer an adequate degree of privacy.

Although mini-browser access through cell phones provides a traveler with limited Internet access, such access is likely to be slow, costly, time consuming due to the limited keyboard, and inadequate due to the cell phone lacking true computer capabilities.

Further, when using cell phones to connect with the Internet, there are issues concerning local cell zones and remote cell zones. Some of these issues have been addressed by STEWART 5,835,061 and 5,969,678. However, the disclosed systems require advance planning, coordination, and registration with a nationwide service cell phone/Internet provider. Such systems may also suffer from reception interference so that connections may be interrupted.

OBJECTS OF THE INVENTION

35 An object of the present invention is to overcome

some of the disadvantages of the prior art systems by providing travelers with a high speed, easy to use, ad hoc wireless local area network Internet access system.

It is a further object of the present invention to
5 provide a novel method of accessing the Internet that avoids interacting with complicated operating system wizards and subsequent system reboots.

It is yet a further object of the present invention to provide a novel method of renting equipment and Internet
10 access to travelers and providing an interface with a local management and accounting system.

It is still a further object of the present invention to provide a novel Internet access system utilizing a wireless local area network with wireless access points and
15 a rental control station. The rental control station is connected to the wireless local area network and through a network access script generator provides a network access script to automatically install a wireless station adapter in a traveler's notebook computer and then to synchronize
20 the wireless station adapter to an access point of wireless local area network so that connectivity to the Internet is provided.

It is another object of the present invention to provide a novel, non-technical system adapted for setting up
25 Internet access and access equipment rental where neither the system operators nor the traveler-users need exercise technical setup skills.

It is yet a further object of the present invention to provide an Internet access and rental system a capability
30 to operate throughout plural wireless access zones.

It is yet another object of the present invention to provide a novel Internet access system that individually monitors each user accessing the Internet through the access system.

It is a still further object of the present invention to provide a novel system of controlling access system
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security by providing users with revisable access codes keyed access codes corresponding to particular system access points, the access codes being subject to remote individual change, change based on code age, and change based on calendar date.

5 These and other objects and advantages of the present invention will be apparent to those of skill in the art from a perusal hereof.

SUMMARY OF THE INVENTION

10 The invention provides a method and system for travelers to easily access the Internet on an ad hoc basis.

 The inventive Internet access system includes a wireless local area network with at least one wireless access point and a rental control station. The rental control station may be a personal computer, optionally
15 including a network access script generator, a network access database, and a data input unit. As an alternative to a script generator, the rental station may include pre-generated script files installed on CD-ROM disks. To connect a traveler's notebook or other communication device
20 to the wireless local area network, and thereby to the Internet, the invention includes a wireless station adapter synchronizable with the access point.

 Advantageously, the network access script generator provides an access script that automatically
25 installs and configures the wireless station adapter into the traveler's notebook. Wireless station adapters include PCMCIA wireless network cards or may be integrated into the user's notebook. Using wireless station adapters, access to the Internet can be 50 to 100 times faster than a dial-up
30 connection.

 The Internet access system may comprise a wireless local area network, such as IEEE 802.11, 802.11a, and 802.11b networks. The inventive system may have plural wireless access points located throughout a building or
35 facility such as a hotel, an airport, college campuses, or

hospitality site with out-of-doors locations. In this way, travelers are free to access the Internet from any convenient location and at a high baud rate.

IEEE 802.11, using the 2.4 GHz band, provides
5 bandwidth at a maximum rate of 2 Mbps. Using IEEE 802.11b High Rate (Wi-Fi), increases the maximum transfer rate to 11 Mbps.

The invention allows for many users to simultaneously access the Internet through the wireless
10 local area network. Conveniently, the inventive system may include plural station adapters, each station adapter being individually addressable from the rental control station via an access point. The station adapters may be synchronized with the access point in a predefined constant frequency, or
15 may be synchronized with the access point by frequency hopping.

The inventive system may use the unlicensed frequency between 2.4 and 2.5 Ghz. Frequency hopping across the entire wireless network frequency ban promotes high
20 confidentiality of transmitted information. Frequency hopping also increases the user capacity of this limited frequency range. A still further advantage of frequency hopping is that such a connection better withstands interference.

25 Using an IEEE 802.11 standard network permits network adaptor cards using infrared, as well as Frequency Hopping Spread Spectrum (FHSS) and Direct Sequence Spread Spectrum (DSSS) radio signals.

FHSS provides 1-MHz channels and a data transfer
30 rate of up to 2 Mbps. DSSS provides partially-overlapping 22-MHz channels. Using chipping, DSSS spreads modulated data across the 22-Mhz channel. DSSS with standard Barker code generates a Binary or Quadrature Phase Shift Keying modulated carrier wave. A maximum transfer rate similar to
35 FHSS results.

802.11b, using DSSS together with Complementary Code Keying, provides a maximum transfer rate of 11 Mbps.

The invention also is suitable for operation in unlicensed 100 MHz sub-bands in the 5 GHz regions.

5 Advantageously, the invention is adaptable to new standards such as IEEE 802.11a. Under developing standards, wireless speeds of 54 Mbps may be attained.

10 The present invention also supports Dynamic Host Configuration Protocols ("DHCP"), e.g., to assign and to renew IP address information at the traveler's notebook computer.

 The invention promotes network security.

15 The invention provides access security through the use of Extended Service Set Ids ("ESSIDs"). Notably, the access script file configures each station adapter with an Extended Service Set ID matching with an Extended Service Set ID associated with an access point. Control within a facility can be provided by assigning different ESSIDs to different access points and limiting a station adapter to be
20 configured with only selected ESSIDs corresponding to areas corresponding to selected access points.

 Both security and accounting functions are enhanced by the rental station including a module for updating a network access database with assigned ESSIDs and
25 information identifying the wireless PCMCIA network card assigned to each traveler-user. Security and accounting are also enhanced by the access script file comprising a time module to alter an ESSID assigned to a particular network adapter after a programmed period of time, after an ESSID
30 expiration date. In this way, if a traveler only needs Internet access for the first day of a three-day visit, the rental control station generates an access script that changes or erases the assigned ESSID after the first day. The traveler thus only pays for the period of anticipated
35 use and need not immediately return the network adapter.

Similarly, the access script file may change the ESSID as a function of a calendar date and time.

After the network adapter has had the ESSID changed or erased, synchronization with the wireless local area network and therefore access to the Internet is lost. However, in the case where the ESSID is changed and not erased, as the network can communicate with the network adapters individually, an access point can be changed to a matching ESSID and re-assign an ESSID to the "de-activated" network adapter so as to re-activate the network adapter.

Alternatively, security can be maintained with encryption, e.g., Wired Equivalent Privacy (WEP) encryption. Encryption is with multibit shared keys, e.g., 40- or 128-bit shared keys. Using public key cryptology, the invention generates session keys to avoid the use of ESSIDs. The traveler and access point exchange a challenge/response encrypted message with the same crypto key.

The invention also includes a feature whereby the inventive rental system includes Internet access-configurable portable computers, e.g., a portable computer with a PCMCIA port or integrated wireless adapter. The rental station operator assigns the user with a notebook, one of the access system's wireless PCMCIA network cards may be inserted in the PCMCIA port, and a computer diskette or CD-ROM containing a wireless network access script. The access script includes a code module for automatically assigning to the wireless PCMCIA network card at least one ESSID matching with an access point ESSID, and an automated device driver for configuring the wireless PCMCIA network card to the portable computer.

The rental control station, through the network access database and communications with the individual network adapters, monitors inventory by tracking network adapters in use, monitors individual access times, and may computer billing charges based on access time.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a view of a first embodiment of the inventive Internet access system of the present invention.

Figure 2 schematically shows the rental control station and access script of the invention.

Figure 3 is a flow chart illustrating the inventive system.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figure 1, a first embodiment of the present inventive system 1 includes a wireless local area network 10 connected to the Internet 100. The wireless local area network 10 may be connected to the Internet 100 via a connecting device such as router 15 and a high-speed line 20.

The wireless local area network includes at least one wireless access point 25, normally located in a building 30. However, the wireless local area network may include plural access points, which access points may be interior to the building and exterior to the building.

A rental control station 35 (or rental station) is located within the building 30 and is connected to the wireless local area network 10 by any convenient technique. As discussed above, the network itself may be of any suitable type, e.g., Ethernet in a star configuration with a central switch 40. The rental control station 35 may be a personal computer or minicomputer. The rental control station 35 may be linked to a facility computer so as to either off-load management and accounting functions to the facility computer or to co-ordinate with the facility computer by data transfers.

The rental control station 35 accepts information concerning a user, e.g., a user's room number, and generates a network access script 110, which script in turn configures the user's notebook computer 45 for an assigned wireless network adapter 50, to bind the TCP/IP protocol, and to render the wireless network adapter 50 as a network and

Internet access device for the user's computer 45. When a CD-ROM with a predetermined script is used, a packet code is entered into the rental control station 35, the rental control station in turn generates a password that activates
5 the wireless adaptor on the network, where the password is unique to the script found on that CD-ROM.

Referring to Figure 2, the rental control station 35 includes a network access script generator 105 for generating a network access script 110 recorded on a
10 computer-readable medium 115. The computer-readable medium may be of any convenient form such as CDROM, diskette, smart card, and memory within a PCMCIA wireless network adapter 50. The script generator 105 may be computer code suitably stored or encoded on the rental control station 35.

15 The rental control station 35 also includes a network access database 120 and a data input unit 125, e.g., a keyboard, mouse, input pad. The rental control station operator uses the data input unit 125 to enter into the rental control station 35 and the network access database,
20 information that uniquely identifies the user, optionally the traveler-user's computer 45, and the to-be-assigned network adapter card 50, as well as appropriate accounting information.

With this information, the network access script
25 generator 105 creates an access script 110 and records the script on the computer-readable medium 115 of choice.

Upon insertion of the computer-readable medium 115 into the traveler-user's notebook 45, the network access script 110 executes to automatically install the drivers for
30 wireless station adapter 50 in the traveler-user's notebook 45 to configure the wireless station adapter 50 for synchronization with an access point 25 by adding to the notebook 45 necessary registry keys to successfully bind TCP/IP to the wireless station adapter when the adapter is
35 subsequently inserted.

Upon subsequent insertion of the station adapter,

the operating system pings the Internet gateway, synchronizing with an access point 25, and automatically launches an Internet browser to complete access to the Internet 100.

5 The network access script 110 synchronizes the station adapter 50 with the access point 25. Access may be, for example, at either a predefined constant frequency, by frequency hopping, or by DSSS.

10 The access script 110 configures the station adapter 45 with an Extended Service Set ID matching with an access point Extended Service Set ID associated with the access point. Unless the traveler-user's station adapter 45 includes an ESSID that matches the access point's ESSID, the traveler-user's notebook 50 is not allowed to join or
15 synchronize with the access point 25 and local area network 10.

 By requiring matching ESSIDs between the station adapter 45 and the access point 25, persons with station adapters tuned to an otherwise acceptable predefined
20 frequency scheme remain barred from joining or synchronizing with the local area network. In this way system security is enhanced and theft of system services is prevented.

 As an alternative to using ESSIDs, the invention supports public key cryptology wherein the wireless adapter
25 and the access point exchange a challenge/response encrypted message with the same crypto key in order to establish synchronization.

 As the rental station controls the ESSIDs, or crypto key, and is in communication with both the access
30 points and the users' notebook computers, the rental station can change ESSIDs, or crypto keys, as necessary to control network, and Internet, access. Any change of ESSIDs or crypto keys would be recorded on the network access database. This approach ensures that the network access
35 database can reliably track station adapter (user) use of the network and Internet as well as bandwidth usage.

System security is also enhanced using the rental control station 35 to monitor each of the plural network station adapters 45 assigned to traveler-users and configured in traveler-users' notebooks 50. The rental control station 35 can communicate individually with each network station adapter, via the wireless network 10 and an access point 25.

Upon synchronization with the network, the system may optionally assign bandwidth to the user's notebook. The assigned bandwidth is recorded in the database 120 for accounting and other purposes.

Referring to Figure 3, there is shown both server-side (rental control station) and client-side (user's notebook 45) activity.

The programming portions of the invention may be implemented in any convenient language and structure. One embodiment utilizes Microsoft™ Access database software with templates for collecting information and providing information to the script generator 105.

The script may be a Word™ document with fixed code and markers where unique information is inserted. Advantageously, the script need vary only as to the unique information such as ESSIDs, crypto keys, dates and passwords.

At the rental control station 35, the operator enters data (at S100) relating to the user and the equipment. For example, the data may include a user's name and room number or, in the case of a pre-programmed CD-ROM, a password. The data is written to database 120 (at S105).

The script generator 105 creates a password and, together with the current date, creates a new script for the user. The script may be encrypted.

Necessary system files, including driver files are recorded on a suitable computer-readable medium, e.g., a diskette (at S110).

The user is given the diskette with the network

access script s110 and necessary ancillary files. At step S120 the user need only insert the diskette into the user's notebook. The script, upon execution, initially attends to various preliminary matters.

5 The preliminary matters include:

- 1) creating new directories and sub-directories for the files associated with the wireless network adapter and necessary for modifying the computer's operating system;
- 2) copying system verifying code, driver files, a date file, and support files onto the user's computer in the newly created directories and the system operating directories;
- 3) backing up the user's computer's registry;
- 4) verifying that the user's computer currently includes necessary compatible scripting components, installing such components if needed; and
- 5) examining the registry for keys necessary to decode any pre-existing encrypted files, and adding necessary keys to support de-encryption.

20 At step S130, and each time the user's computer is booted, the script directs that a date-verification be completed. The date file, loaded in step S120, includes an ESSID expiration date, typically step for some fixed period, e.g., 20 days from checkout of the system equipment, as discussed above to discourage theft of equipment and services.

30 If the present date is beyond the ESSID expiration date, the script setup operation halts and the user is prompted to renew the access script at the rental control station.

At step S140, the ESSID expiration date is set into an operating system directory for future reference and control. The script next invokes a registry key inspection which identifies existing protocol stack components and determines the necessary registry keys to be added in order to successfully bind TCP/IP protocol to the wireless network

adapter.

After the inspection and determination are complete, the script writes the necessary registry keys and copies appropriate adapter devices onto the user's computer.

5 At this point, at least one ESSID (or crypto key) is set by writing to a registry file. Upon successfully copying the necessary files, at step S150, the script silently registers the network adapter's device driver files with the operating system registry.

10 This approach of the invention advantageously avoids any interaction with, or any invocation of, operating system wizards. Avoiding the use of wizards simplifies the configuration process and enhances the user's experience, as the user is not subjected to responding to wizard prompts.
15 Further, no rebooting of the computer is required, again enhancing the user's experience.

The network adapter having been registered with the operating system, at step S160, the user is prompted to insert the network adapter itself into the computer. Upon the
20 computer sensing insertion of the network adapter, the adapter is instructed to ping the network gateway and thereafter automatically launch the default Internet browser.

As noted above, upon each boot of the user's computer, step S130 is invoked to verify the current date is
25 not beyond the ESSID expiration date. If the current date is beyond the expiration date, the user is prompted to renew (check out again) the network access script and network adapter. At this time, the files previously loaded onto the user's computer may, optionally, be erased and the system
30 registry restored. Alternatively, the ESSID may be erased or changed to an ESSID having limited network and Internet access.

In one embodiment, the script makes the gateway address, DNS server, and IP address assignment to the
35 wireless adapter. In another embodiment, when the wireless adapter connects to the access point, it is subsequently

connected to a network segment where DHCP is active. DHCP assigns the gateway address, DNS server, and IP address assignments to the wireless adapter.

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